

CLAIMS

1. A pattern comparison inspection method which captures an image of an inspection target pattern having a repeated pattern region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, and which detects a defect in said inspection target pattern by comparing image signals taken from positions located a first integral multiple of said repeat pitch away from each other within an inspection region defined inside said repeated pattern region, said method comprising:
- a reference position selecting step for selecting from among positions on said inspection target pattern a reference position which is judged whether it should be contained in said inspection region;
 - an image comparing step for comparing an image signal at said reference position with an image signal at a position located a second integral multiple of said repeat pitch away from said reference position; and
 - an inspection region setting step for setting said inspection region by containing therein said reference position when a comparison result from said image comparing step shows a value not greater than a prescribed threshold value.
2. A pattern comparison inspection method which captures an image of an inspection target pattern having a repeated pattern region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, and which detects a defect in said inspection target pattern by comparing image signals taken from positions located a first integral multiple of said repeat pitch away from each other within an inspection region defined inside said repeated pattern region, said method comprising:
- a reference position selecting step for selecting a reference position which is judged whether it should be contained in said inspection region, by incrementally shifting said reference position by a

prescribed distance within said inspection target pattern;

5 an image comparing step for comparing an image signal at said reference position with an image signal at a position located a second integral multiple of said repeat pitch away from said reference position; and

10 an inspection region setting step for setting said reference position as the boundary of said inspection region when a comparison result from said image comparing step performed by incrementally shifting said reference position by said prescribed distance shows a change greater than a prescribed threshold value.

15 3. A pattern comparison inspection method which captures an image of an inspection target pattern having a repeated pattern region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, and which detects a defect in said inspection target pattern by comparing image signals taken from positions located a first integral multiple of said repeat pitch away from each other within an inspection region defined inside said repeated pattern region, said method comprising:

20 a reference position selecting step for selecting a reference position which is judged whether it should be contained in said inspection region, by incrementally shifting said reference position by a prescribed distance within said inspection target pattern;

30 an image comparing step for comparing an image signal at said reference position with an image signal at a position located a second integral multiple of said repeat pitch away from said reference position; and

35 an inspection region setting step for setting said reference position as the boundary of said inspection region when a comparison result from said image comparing step performed by incrementally shifting

said reference position by said prescribed distance shows a maximum change.

4. A pattern comparison inspection method as claimed in any one of claims 1 to 3, wherein said image
5 comparing step compares said image signal at said reference position with an image signal at a position located farther inside said repeated pattern region than said reference position is.

5. A pattern comparison inspection method as
10 claimed in any one of claims 1 to 3, wherein a position located a prescribed distance inward of the boundary of said repeated pattern region is selected as said reference position, and

said inspection region is set by
15 repeatedly performing said image comparing step while incrementally moving said reference position outwardly toward the boundary of said repeated pattern region.

6. A pattern comparison inspection method as claimed in any one of claims 1 to 3, further comprising a
20 tentative region setting step for setting a tentative region a prescribed distance inward of the boundary of said repeated pattern region, and wherein

said image comparing step compares said
image signal at said reference position with an image
25 signal at a position located inside said tentative region.

7. A pattern comparison inspection method as claimed in claim 6, wherein a position located inside
said tentative region is selected as said reference
30 position, and

said inspection region is set by
repeatedly performing said image comparing step while
incrementally shifting said reference position outwardly
toward the boundary of said repeated pattern region.

8. A pattern comparison inspection method as
35 claimed in any one of claims 1 to 3, wherein a position located a prescribed distance outward of the boundary of

said repeated pattern region is selected as said reference position, and

said inspection region is set by repeatedly performing said image comparing step while incrementally shifting said reference position inwardly toward the boundary of said repeated pattern region.

9. A pattern comparison inspection method which captures an image of an inspection target pattern having a repeated pattern region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, and which detects a defect in said inspection target pattern by comparing image signals taken from positions located an integral multiple of said repeat pitch away from each other, said method comprising:

a defect candidate detecting step for comparing a predetermined first threshold value with a difference value taken between pixels separated from each other by a number of pixels equivalent to said integral multiple of said repeat pitch in said captured image of said inspection target pattern, and for detecting any pixel for which said difference value exceeds said first threshold value as a defect candidate;

an inspection range determining step for selecting a reference range of a prescribed size within said captured image of said inspection target pattern, and for determining an inspection range by containing therein said reference range if the number of defect candidates contained in said reference range or the proportion of said defect candidates contained in said reference range is smaller than a predetermined second threshold value; and

a detecting step for detecting a defect in said inspection target pattern within said inspection range.

10. A pattern comparison inspection method as claimed in claim 9, further comprising:

a defect candidate map generating step for

generating a defect candidate map by obtaining said defect candidate in said defect candidate detecting step for each pixel in said captured image of said inspection target pattern; and

5 a reference range selecting step for selecting a reference range of a prescribed size within said defect candidate map, wherein

 said inspection range determining step determines said inspection range by containing therein
10 said selected reference range if the number of defect candidates contained in said reference range or the proportion of said defect candidates contained in said reference range is smaller than said predetermined second threshold value.

15 11. A pattern comparison inspection method which captures an image of an inspection target pattern having a repeated pattern region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, and which detects a defect in said inspection target pattern
20 by comparing image signals taken from positions located an integral multiple of said repeat pitch away from each other, said method comprising:

 a defect candidate detecting step for comparing a predetermined first threshold value with a
25 difference value taken between pixels separated from each other by a number of pixels equivalent to said integral multiple of said repeat pitch in said captured image of said inspection target pattern, and for detecting any pixel for which said difference value exceeds said first
30 threshold value as a defect candidate;

 an inspection range determining step for selecting a reference range of a prescribed size within said captured image of said inspection target pattern by incrementally changing the position of said reference
35 range relative to a prescribed direction, and for determining an inspection range by containing therein said position relative to said prescribed direction if

the number of defect candidates contained in said reference range or the proportion of said defect candidates contained in said reference range is smaller than a predetermined second threshold value; and

5 a detecting step for detecting a defect in said inspection target pattern within said inspection range.

12. A pattern comparison inspection method as claimed in claim 11, further comprising:

10 a defect candidate map generating step for generating a defect candidate map by obtaining said defect candidate in said defect candidate detecting step for each pixel in said captured image of said inspection target pattern; and

15 a reference range selecting step for selecting a reference range of a prescribed size within said defect candidate map by incrementally changing the position of said reference range relative to a prescribed direction, wherein

20 said inspection range determining step determines said inspection range by containing therein said position relative to said prescribed direction if the number of defect candidates contained in said reference range or the proportion of said defect
25 candidates contained in said reference range is smaller than said predetermined second threshold value.

13. A pattern comparison inspection apparatus which comprises an imaging portion which captures an image of an inspection target pattern having a repeated pattern
30 region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, a storing portion which stores said captured image of said inspection target pattern, a pattern comparing portion which compares, on said stored image, image signals taken from
35 positions located a first integral multiple of said repeat pitch away from each other within an inspection region defined inside said repeated pattern region, and a

defect detecting portion which detects a defect in said inspection target pattern based on a result of said comparison, said apparatus comprising:

5 a reference position selecting portion which selects from among positions on said inspection target pattern a reference position which is judged whether it should be contained in said inspection region;

10 an image comparing portion which compares an image signal at said reference position with an image signal at a position located a second integral multiple of said repeat pitch away from said reference position; and

15 an inspection region setting portion which sets said inspection region by containing therein said reference position when a comparison result from said image comparing portion shows a value not greater than a prescribed threshold value.

14. A pattern comparison inspection apparatus which comprises an imaging portion which captures an image of
20 an inspection target pattern having a repeated pattern region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, a storing portion which stores said captured image of said inspection target pattern, a pattern comparing portion which
25 compares, on said stored image, image signals taken from positions located a first integral multiple of said repeat pitch away from each other within an inspection region defined inside said repeated pattern region, and a defect detecting portion which detects a defect in said
30 inspection target pattern based on a result of said comparison, said apparatus comprising:

35 a reference position selecting portion which selects a reference position which is judged whether it should be contained in said inspection region, by incrementally shifting said reference position by a prescribed distance within said inspection target pattern;

an image comparing portion which compares
an image signal at said reference position with an image
signal at a position located a second integral multiple
of said repeat pitch away from said reference position;
5 and

an inspection region setting portion which
sets said reference position as the boundary of said
inspection region when a comparison result, obtained from
said image comparing portion as a result of incrementally
10 shifting said reference position by said prescribed
distance, shows a change greater than a prescribed
threshold value.

15. A pattern comparison inspection apparatus which
comprises an imaging portion which captures an image of
15 an inspection target pattern having a repeated pattern
region with repeated patterns formed in a repeated
fashion at a prescribed repeat pitch, a storing portion
which stores said captured image of said inspection
target pattern, a pattern comparing portion which
20 compares, on said stored image, image signals taken from
positions located a first integral multiple of said
repeat pitch away from each other within an inspection
region defined inside said repeated pattern region, and a
defect detecting portion which detects a defect in said
25 inspection target pattern based on a result of said
comparison, said apparatus comprising:

a reference position selecting portion
which selects a reference position which is judged
whether it should be contained in said inspection region,
30 by incrementally shifting said reference position by a
prescribed distance within said inspection target
pattern;

an image comparing portion which compares
an image signal at said reference position with an image
35 signal at a position located a second integral multiple
of said repeat pitch away from said reference position;
and

an inspection region setting portion which sets said reference position as the boundary of said inspection region when a comparison result, obtained from said image comparing portion as a result of incrementally shifting said reference position by said prescribed distance, shows a maximum change.

16. A pattern comparison inspection apparatus as claimed in any one of claims 13 to 15, wherein said image comparing portion compares said image signal at said reference position with an image signal at a position located farther inside said repeated pattern region than said reference position is.

17. A pattern comparison inspection apparatus as claimed in any one of claims 13 to 15, wherein a position located a prescribed distance inward of the boundary of said repeated pattern region is selected as said reference position, and

said inspection region is set by repeatedly performing said comparison by said image comparing portion while incrementally moving said reference position outwardly toward the boundary of said repeated pattern region.

18. A pattern comparison inspection apparatus as claimed in any one of claims 13 to 15, further comprising a tentative region setting portion which sets a tentative region a prescribed distance inward of the boundary of said repeated pattern region, and wherein

said image comparing portion compares said image signal at said reference position with an image signal at a position located inside said tentative region.

19. A pattern comparison inspection apparatus as claimed in claim 18, wherein a position located inside said tentative region is selected as said reference position, and

said inspection region is set by repeatedly performing said comparison by said image

comparing portion while incrementally shifting said reference position outwardly toward the boundary of said repeated pattern region.

5 20. A pattern comparison inspection apparatus as claimed in any one of claims 13 to 15, wherein a position located a prescribed distance outward of the boundary of said repeated pattern region is selected as said reference position, and

10 said inspection region is set by repeatedly performing said comparison by said image comparing portion while incrementally shifting said reference position inwardly toward the boundary of said repeated pattern region.

15 21. A pattern comparison inspection apparatus which comprises an imaging portion which captures an image of an inspection target pattern having a repeated pattern region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, a pattern comparing portion which compares, on said captured image, image
20 signals taken from positions located an integral multiple of said repeat pitch away from each other, and a defect detecting portion which detects a defect in said inspection target pattern based on a result of said comparison, said apparatus comprising:

25 a defect candidate detecting portion which compares a predetermined first threshold value with a difference value taken between pixels separated from each other by a number of pixels equivalent to said integral multiple of said repeat pitch in said captured image of
30 said inspection target pattern, and which detects any pixel for which said difference value exceeds said first threshold value as a defect candidate; and

35 an inspection range determining portion which selects a reference range of a prescribed size within said captured image of said inspection target pattern, and which determines an inspection range by containing therein said reference range if the number of

defect candidates contained in said reference range is smaller than a predetermined second threshold value, wherein

5 said defect detecting portion detects a defect in said inspection target pattern within said inspection range.

22. A pattern comparison inspection apparatus as claimed in claim 21, further comprising:

10 a defect candidate map generating portion which generates a defect candidate map by obtaining said defect candidate from said defect candidate detecting portion for each pixel in said captured image of said inspection target pattern; and

15 a reference range selecting portion which selects a reference range of a prescribed size within said defect candidate map, wherein

20 said inspection range determining portion determines said inspection range by containing therein said selected reference range if the number of defect candidates contained in said reference range is smaller than said predetermined second threshold value.

23. A pattern comparison inspection apparatus which comprises an imaging portion which captures an image of an inspection target pattern having a repeated pattern
25 region with repeated patterns formed in a repeated fashion at a prescribed repeat pitch, a pattern comparing portion which compares, on said captured image, image signals taken from positions located an integral multiple of said repeat pitch away from each other, and a defect
30 detecting portion which detects a defect in said inspection target pattern based on a result of said comparison, said apparatus comprising:

35 a defect candidate detecting portion which compares a predetermined first threshold value with a difference value taken between pixels separated from each other by a number of pixels equivalent to said integral multiple of said repeat pitch in said captured image of

said inspection target pattern, and which detects any pixel for which said difference value exceeds said first threshold value as a defect candidate; and

5 an inspection range determining portion
which selects a reference range of a prescribed size
within said captured image of said inspection target
pattern by incrementally changing the position of said
reference range relative to a prescribed direction, and
which determines an inspection range by containing
10 therein said position relative to said prescribed
direction if the number of defect candidates contained in
said reference range or the proportion of said defect
candidates contained in said reference range is smaller
than a predetermined second threshold value, wherein
15 said defect detecting portion detects a
defect in said inspection target pattern within said
inspection range.

24. A pattern comparison inspection apparatus as
claimed in claim 23, further comprising:

20 a defect candidate map generating portion
which generates a defect candidate map by obtaining said
defect candidate from said defect candidate detecting
portion for each pixel in said captured image of said
inspection target pattern; and

25 a reference range selecting portion which
selects a reference range of a prescribed size within
said defect candidate map by incrementally changing the
position of said reference range relative to a prescribed
direction, wherein

30 said inspection range determining portion
determines said inspection range by containing therein
said position relative to said prescribed direction if
the number of defect candidates contained in said
reference range or the proportion of said defect
35 candidates contained in said reference range is smaller
than said predetermined second threshold value.